

REMARKS

Claims 1-28 are pending and stand rejected. Claims 1, 8-13, 16, 19, 24, 25, and 27 are amended as discussed further herein. Claim 4 has been canceled without prejudice.

No new matter is believed to have been added by these amendments. Applicants reserve the right to pursue the subject matter of the original claims in this application and in other applications. In view of the amendments made and the remarks below, reconsideration and further examination are respectfully requested.

Pursuant to the Examiner's request, Applicants enclose herewith additional copies of each of the four (4) references cited in their IDS submitted upon filing. Applicants respectfully request that the Examiner consider the references and initial the PTO Form 1449 to confirm that the references have been considered.

Drawing Objections

The Examiner has objected to the drawings under 37 CFR §1.83(a), stating that "the image device positioned at a body to be irradiated and an electron beam directed at the body as recited in claim 13 must be shown or the feature(s) canceled from the claim(s)." Applicants respectfully traverse this ground of objection and note that a "body to be irradiated" is clearly shown and illustrated in the figures as filed. For example, FIGs. 1 and 3 show a body (or an "object" or a "patient") designated as item 22. Applicants are unsure how such a feature could be more clearly illustrated in the figures. Nevertheless, to advance the case, Applicants have amended claim 13 (and claims 16, 19, 24 and 25) to replace the term "body" with the term "object". This amendment is not intended to narrow the claims, and is solely provided as a clarifying amendment in response to the Examiner's objection to the drawings.

Claim Rejections – 35 USC §112, 2d para

The Examiner has rejected claims 8-18 under 35 USC §112, 2d paragraph, as being indefinite. Applicants respectfully thank the Examiner for noting the antecedent basis issues associated with claims 8-12. Claims 8-12 are hereby amended to depend from appropriate claims providing antecedent basis.

Claim 13 has been amended to clarify the issues noted by the Examiner. No new matter is believed added, nor is any narrowing intended to be inferred from these clarifying amendments. Each of the claims are believed in compliance with 35 USC §112 and withdrawal of the rejection is respectfully requested.

Claim Rejections –35 USC § 102(b)

Claims 1-28 are rejected under 35 USC § 102(b) as anticipated by Ueda et al (U.S. Patent No. 5,396,889). Applicant respectfully traverses this ground of rejection.

The Ueda reference describes a conventional radiotherapy system that uses primary photon (or X-ray) radiation beams to treat a patient. As with other conventional primary photon radiation therapy systems, the radiation source in Ueda is an electron accelerator (item 13 of FIG. 1). As with other conventional primary photon radiation therapy systems, the Ueda system converts the electron beam into a photon beam before it leaves the treatment head by use of a scattering target (item 1 of FIG. 1). As with other conventional primary photon radiation therapy systems, the Ueda system then directs the photon (or X-ray) beam (item 15 of FIG. 1) toward a patient for treatment.

As discussed in Applicants' background section (e.g., at page 4), "[p]hoton radiation therapy is well-suited to portal imaging". Applicants are not claiming such a conventional photon radiation therapy imaging system. Instead, Applicants claim an imaging system that is designed for use in a electron radiation therapy system. As discussed in the background section, prior to Applicants' invention, electron therapies have not been suited to portal imaging, because electrons are not transmitted completely through a patient's body.

The Ueda reference fails to teach or suggest embodiments as recited in claim 1. In particular, Ueda fails to teach or suggest a method of verifying an electron treatment field created by an electron treatment beam. Applicants have amended claim 1 to emphasize that the claimed method includes directing an electron treatment beam from a treatment head toward a location to be irradiated to further clarify that embodiments allow operation of an imaging device in an electron radiotherapy (that is, where the therapeutic beam directed from a treatment head toward a patient is an electron treatment beam). Further, the imaging device is operated to detect an image created by photons generated in the delivery of the electron beam to the location to be irradiated.

As discussed above, Ueda describes a conventional radiation therapy system that uses a primary photon treatment beam. A primary photon treatment beam is not the same as a primary electron treatment beam, and has substantially different characteristics. One of the different characteristics is that a primary electron treatment beam does not pass through a patient's body, providing desirable treatment characteristics, but also making it difficult to obtain portal images. Applicants' invention is directed to solving these difficulties.

Because Ueda fails to teach or suggest a method of verifying an electron treatment field created by an electron treatment beam, Ueda fails to anticipate embodiments of the present invention as recited in claim 1. Further, Applicants respectfully assert that it would not have been obvious, at the time of Applicants' invention, to modify Ueda to arrive at the invention of claim 1. As discussed in Applicants' background section, there are substantial differences between imaging of primary photons and imaging of primary electrons, and Ueda provides no disclosure of the desirability of such imaging of a primary electron beam. Claim 1, at least as amended, is patentable over the Ueda reference.

Dependent claims 2-3, and 5-12 are believed patentable at least as depending from a patentable base claim. Further, each of the other independent claim sets (including claims 13, 19, 25 and 28, and their respective dependent claims) are believed patentable for similar reasons.

Other claims recite further features that are not taught or suggested by the Ueda reference. For example, the Ueda reference fails to teach or suggest enhancing the image to generate a representation of the electron treatment field as recited in claim 2, at least because Ueda does not describe delivery of an electron treatment field (but rather describes delivery of a photon treatment field). Further, there is simply no teaching or suggestion anywhere in Ueda that a captured image of any type is enhanced. Enhancement allows some embodiments to perform imaging on electron treatment fields that have relatively low amounts of bremsstrahlung photons. The Examiner asserts that Ueda describes "an image processing apparatus 109 for enhancing the image to generate a representation of the electron treatment field". (Office Action at page 4). Applicants respectfully disagree with this characterization of Ueda. The "image processing apparatus 109" does not perform any such image enhancement. Instead, as discussed at Col. 8, lines 21-37, the apparatus 109 is used to compare and display the positions of the radiosopic image (a pre-treatment measurement) and the image of the therapy X-ray beam. These images are displayed on the CRT. That is, at most, Ueda describes comparing two images to identify positional displacement; there is simply no teaching or suggestion of any image enhancement in Ueda. As such, claim 2 (and, similarly, claims 9-12, 14, 16-17, and 25-27) is believed further patentable over Ueda for this reason.

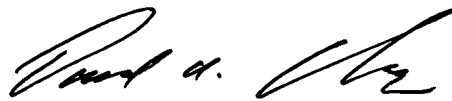
Other claims recite further features of the enhancement. For example, claim 8 relates to embodiments where image enhancement includes determining an energy of the electron treatment beam, calculating an angular dependence of photons on the beam, and generating a representation of the field based on the detected image and the calculated angular dependence. In this manner, low amounts of bremsstrahlung photons can be detected and used to create a detailed image. There is simply no teaching or suggestion in Ueda to perform any such image enhancement. Claim 8 is believed patentable over Ueda for this additional reason. Further image enhancement techniques are recited in claims 9-12 and each is believed patentable over Ueda. Claims 17 and 23 are believed patentable for similar reasons.

Still other claims (such as claims 18 and 24) recite the generation of an open field image and a detected image to produce a representation of an electron treatment field (a feature not taught or suggested by Ueda).

Applicants respectfully assert that a number of claim features are not taught by Ueda, and respectfully submit that all of the claims are in condition for allowance and the Examiner's early re-examination and reconsideration are respectfully requested. Applicants note that the amendments to claims 1, 13, and 28 are for clarity only, and that the claims as presented recited patentable subject matter over the Ueda reference. If there remains any question regarding the present application or any of the cited references, or if the Examiner has any further suggestions for expediting allowance of the present application, the Examiner is cordially requested to contact the undersigned.

Respectfully submitted,

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Date



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Enclosures: Four (4) References Cited In Prior IDS